

OCHROSIA (APOCYNACEÆ) OF THE HAWAIIAN ISLANDS, HAWAIIAN PLANT STUDIES 60

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ABSTRACT: Recognition of speciation in *Ochrosia* in the Hawaiian Islands resulting in 5 species on Oahu, 3 on Hawaii, and 1 each on Kauai, Molokai, and Maui.

RÉSUMÉ : Spéciation du genre *Ochrosia* dans les îles hawaïennes : 5 espèces à Oahu, 3 à Hawaii, et 1 respectivement à Kauai, Molokai et Maui.

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This revision concerns the native species of *Ochrosia* (Apocynaceæ) in the Hawaiian Islands. The genus was apparently first collected on the islands in 1826-27 by G. T. LAY and A. COLLÆ, botanists of the " Blossom " voyage, under Capt. F. W. BEECHY. W. J. HOOKER and G. A. WALKER-ARNOTT identified the specimen as *Cerbera parviflora* H. & A., but Alphonse DE CANDOLLE disagreed and described it as *Ochrosia sandwicensis* A. DC., (1844: 357). Actually the holotypic specimen was a *Rauvolfia*, and a synonym of *R. sandwicensis* A. DC., published on page 339 of his same volume (1844).

Despite these impediments, the binomial *O. sandwicensis* was regularly used for the Hawaiian tree, by attributing it to GRAY (1862: 333), but GRAY did not publish such a species, rather he merely used the earlier incorrect name *O. sandwicensis* A. DC.

Botanists have considered there to be but a single species in the Hawaiian Islands, except that HILLEBRAND published an unnamed var. β from a collection from Nuuanu Valley, Oahu. Later this was named *O. compta* K. Schum., and again *Bleekeria* (K. Schum.) Wilbur. The later expanded his *compta* to include the species called *O. sandwicensis*. None of the early botanists detected any local speciation in the group. The present author has collected and studied the Hawaiian *Ochrosia*, and now presents a new classification, recognizing eleven local endemics: five on Oahu, three on Hawaii, and one each on Kauai, Molokai, and Maui.

KEY TO SPECIES

1. Leaves opposite; blades elliptic, 5.6-7 cm wide; petioles 24-33 mm long; calyx lobes 3-3.5 mm long. Oahu 1. *O. compta*
- 1'. Leaves 3-4-vericillate; blades relatively narrower; petioles 7-30 mm long.

2. Calyx lobes 4-6 mm long; corolla lobes 10-14 mm long; fruit obtuse.
3. Fruit purplish black; calyx lobes 5 mm long; blades subacuminate; corolla lobes 10-11 mm long. Oahu. 10. *O. lamoureuxii*
- 3'. Fruit green to yellow.
4. Calyx 10-11 mm long, the lobes 5-6 mm long; corolla lobes 4 mm wide; blades subacuminate. Hawaii. 7. *O. kilauaeensis*
- 4'. Calyx 6-8 mm long, the lobes 4.5-5 mm long; corolla lobes 3 mm wide; blades obtuse. Hawaii. 8. *O. konaensis*
- 2'. Calyx lobes 1.2-3 mm long; corolla lobes 6.5-11 mm long; fruit yellow.
5. Calyx lobes 3 mm long.
6. Corolla lobes 11 mm long, 3.5-4 mm wide; blades obtuse, 4.8-5.6 cm wide. Hawaii. 4. *O. hamakuaensis*
- 6'. Corolla lobes 8-9 mm long, 2.5 mm wide; blades 2.7-4.6 cm wide. Oahu. 9. *O. kondoii*
- 5'. Calyx lobes 1.2-3 mm long.
7. Calyx lobes 2 mm long; corolla tube 4 mm long, the lobes 7 mm long, 2 mm wide; blades obtuse; stigma apex narrowly lanceoloid. Oahu. 11. *O. microcalyx*
- 7'. Calyx lobes 1.2-3 mm long; corolla tube 6-12 mm long.
8. Calyx lobes 1.2-1.7 mm long; blades subacute. Molokai. 2. *O. forbesii*
- 8'. Calyx lobes 2-3 mm long.
9. Calyx 3-3.5 mm long, the lobes 2-2.5 mm long; blades obtuse, 6-9 cm long, elliptic; corolla lobes 5 mm wide, obovate; stigma apex cylindric. Maui. 3. *O. haleakalae*
- 9'. Calyx 4-5 mm long, the lobes 2.5-3 mm long.
10. Blades narrowly oblong oblanceolate, 1.8-5.4 cm wide, acute; corolla lobes 3 mm wide; stigma apex cylindric; fruit narrowly ovoid. Oahu. 5. *O. holei*
- 10'. Blade elliptic oblanceolate, 2.5-6.1 cm wide, the apex umbonate; corolla lobes 3.5 mm wide; stigma apex bifid; fruit lanceoloid. Kauai. 6. *O. kauaiensis*

1. *Ochrosia compta* K. Schum.

Pflanzenfam. 4'(2): 156 (1895); Rock, Indig. Trees Haw. Is.: 414 (1913); St. JOHN, Pacif. Trop. Bot. Gard., Mem. 1: 280 (1973), as to Nuuanu plant only, non *O. sandwicensis* sensu GRAY.

— *O. sandwicensis* var. β , HILLEBR., Fl. Haw. Is.: 297 (1888).

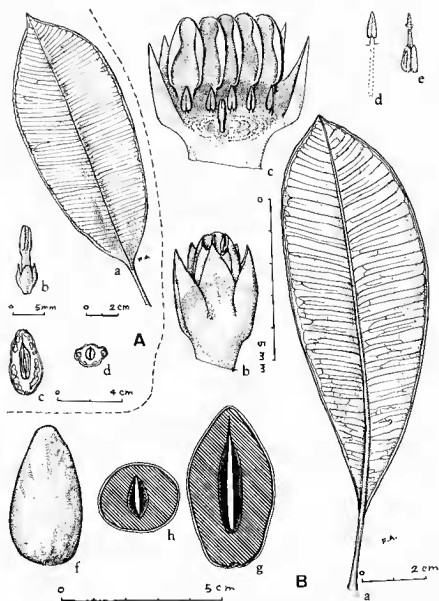
— *Bleekeria compta* (K. SCHUM.) WILBUR, Pacif. Sci. 20: 260 (1966), only as to basionym, non *O. sandwicensis* sensu GRAY.

TYPE: *Hillebrand 319*, Sandwich Islands, Oahu, Nuuanu (holo., B, delet.; iso., K!).¹

ORIGINAL DIAGNOSIS: "Leaves opposite, 7-9' \times 2 1/2-3', on petioles of 1-1 1/2', coriaceous, with prominent nerves. Cymes densely flowered. Oahu! Nuuanu."

EXPANDED DIAGNOSIS FROM ISOTYPE: Doubtless a tree, glabrous; leafy branches 4-7 mm in diameter, terete, brown, smooth; internodes

1. As a matter of fact, the number 319 is indicated on the Kew sheet only.



Pl. I. — A, *Ochrosia compta* K. Schum. (from isotype) : a, leaf; b, bud; c, d, fruit. — B, *O. forbesii* St. John (from holotype) : a, leaf; b, bud; c, corolla, cut open; d, stamen; e, pistil; f, g, h, fruit.

8-12 mm long; leaf scars 5-8 mm wide, shield-shaped, elevated, pale brown; bundle scars 3, being a large central one and 2 small lateral ones; leaves opposite; petioles 24-33 mm long, stout, subterete; blades 12-17.5 cm long, 5.6-7 cm wide, truly elliptic or slightly wider at the outer 1/3, coriaceous, above dark shiny green, below paler green, entire, the apex abruptly sub-acuminate, the base shortly cuneate, the midrib strong, the secondary lateral veins multitudinous, approximate, parallel, extending almost at right angles from the midrib to the margin where they are united by a sinuous marginal vein; cymes at the terminal axils, in flower 3.5 cm long, rather compact, many flowered; peduncle 14-17 mm long; calyx 4.5-5 mm long, the tube 1.5-2 mm long, the 5 calyx lobes 3-3.5 mm long, ovate, thick and fleshy, especially below; corolla (seen only as an immature bud) with the tube 4 mm long, the 5 circinnate lobes 4 mm long; cyme branches in fruit 5.5 cm long, 4 mm in diameter, cernuous; fruits 4.2-4.3 cm long, 2 cm wide, 1.5-1.7 cm thick, lanceoloid, slightly asymmetric; endocarp 3.6 cm long, 1.8-2 cm wide, 1.1-1.4 cm thick, the lateral walls 4-7 mm thick; seed 22 mm long, 8 mm wide, 5 mm thick. — Pl. 1, A.

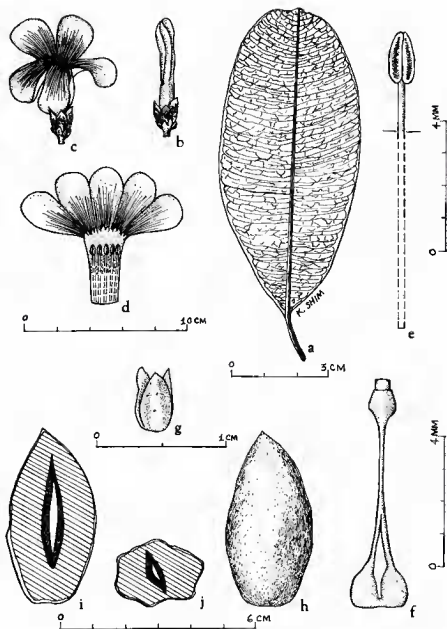
DISCUSSION: This plant is known only from the collection by HILLEBRAND in Nuuanu Valley, as no more recent collections of it have been made. The Hawaiian *Ochrosia* species are to be found in the lower, drier forests. Nuuanu is the central valley of Honolulu, its estuary making the small harbor. It is one of the larger valleys, and its lower, drier parts; and the middle and wetter parts have now long been fully occupied by the urban sprawl of the enlarging city. It seems certain that this endemic species had been exterminated.

ROCK (1913: 414) accepted *O. compta*, based upon the description by HILLEBRAND, and the epithet provided by SCHUMANN, but ROCK commented, "The writer has never met with this plant, but desires to express the opinion that it is a rather doubtful species and perhaps only a form of *Ochrosia sandwicensis*." It is obvious that ROCK never studied the holotype in Berlin or the isotype in Kew. The isotype at Kew consists of two ample sheets, one with a fruiting branch, the other a flowering one, but unfortunately there are no mature flowers, only several flower buds, apparently from half to two-thirds full sized. In the other Hawaiian species, a flowering branch on one day will have one or very few open flowers, and these fall quickly, so the majority of the herbarium specimens lack mature flowers. The writer wished for a good flower on this isotype so that he could present its structural details, but alas, this is none.

2. *Ochrosia forbesii* St. John, *sp. nov.*

Folia 4-verticillata, lamina subacuta; calycis lobi 1,2-1,7 mm longi, corollæ lobi 6,5-7 mm longi; drupæ 3,8-4,5 cm longæ.

TYPE: St. John, J. Dunn & W. B. Storey 13307, Hawaiian Islands, Molokai Island, Kukuinui Ridge, Wailau Valley, moist woods, 1500 ft, 4.7.1933 (holo-, BISH).



Pl. 2. — *Ochrosia haleakalae* St. John : a, leaf; b, bud; c, flower; d, flower, cut open; e, stamen; f, pistil (from holotype); g, calyx; h, i, j, fruit (from Forbes 1970.M.).

DIAGNOSIS OF HOLOTYPE: Glabrous tree 6.6 m tall; trunk 20 cm in diameter; leafy branchlets 3-5 mm in diameter, dull reddish, smooth; internodes 0.7-7.5 cm long; leaves 4-verticillate; leaf scars 2.5-3 mm wide, cordate, elevated, stramineous; bundle scar single, central; petioles 1.2-3 cm long, reddish; blades 5-13 cm long, 1.8-4.6 cm wide, oblanceolate, the apex subacute, the base cuneate, above green, below pale green and prominently reticulate veiny, thin coriaceous; cymes 4.5-12 cm long in flower, loose, in fruit 10-14 cm long; peduncle 1.5-2 cm long, 12-24-flowered; calyx 3-4 mm long, the lobes 1.2-1.7 mm long, lance-ovate; corolla (immature) tube 6-7 mm long, the 5 lobes 6.5-7 mm long, elliptic, circinnate, white; 5 stamens; filaments attached to the corolla tube for 1.6 mm; free filament tips 0.2 mm long; anthers 0.8 mm long, 0.3 mm wide, lanceoloid, compressed, bifid at base; ovary 0.8 mm long, obcuneate cylindric, 4-lobed; style 0.7 mm long, subulate, glabrous; stigma subulate above the dilated base; twin drupes 3.8-4.5 cm long, 1.9-2.2 cm wide, 1.7-1.8 cm thick, lanceoloid, slightly asymmetric, the apex obtuse; endocarp 35 mm long, 14 mm wide, 7 mm thick, narrowly ellipsoid, the lateral walls 3 mm thick; seed 25 mm long, 11 mm wide, 2 mm thick, narrowly lanceoloid, compressed.

EXPANDED DESCRIPTION: Internodes 0.4-7.5 cm long; blades 5-15.5 cm long; cymes 3.5-12 cm long; fruit 3.8-5.3 cm long, 1.7-2.2 cm wide, 1.3-1.8 cm thick, obtuse or acute. — Pl. I, B.

SPECIMENS EXAMINED: *Forbes 251.Mo.*, Hawaiian Islands, Molokai Island, Pelekunu Trail, pali side, 7.1912, BISH, K, NY; *Forbes 260.Mo.*, Kahanui, 7.1912, BISH; *Forbes 344.Mo.*, Wailau Valley, slopes of Oloku'i, 9.1912, A, BISH, GH, K, NY, US.

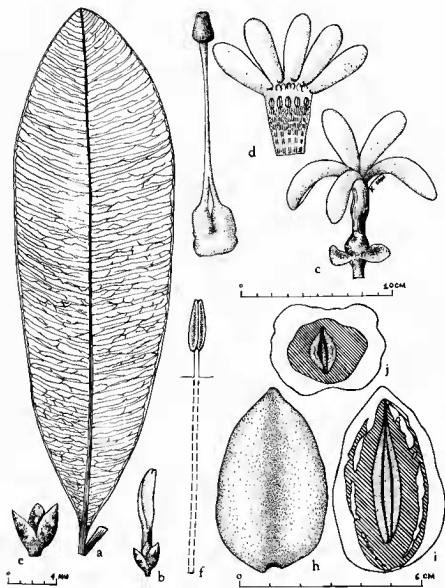
The new epithet is given in honor of Charles Noyes FORBES (1883-1920), first botanist of the Bishop Museum.

3. *Ochrosia haleakalæ* St. John, *sp. nov.*

Folia 3-4-verticillata, lamina obtusa; calycis lobi 2-2.5 mm longi; corollæ lobi 7-10 mm longi; drupæ 5.3 cm longæ.

TYPE: *Sohmer 6599*, Hawaiian Islands, east Maui Island, Auahi, dry forest, 3000-4000 ft, 20.8.1970 (holo-, BISH).

DIAGNOSIS OF HOLOTYPE: Glabrous tree; internodes 0.5-5 cm long; leaves 3-4-verticillate; petioles 8-18 mm long; blades 6-9 cm long, 2.5-3.5 cm wide, elliptic, the apex obtuse, the base shortly cuneate, above dark green and shiny, below pale green and prominently reticulate veiny, subcoriaceous; cymes 5-6 cm long, in flower loose; peduncle 3 cm long; calyx 3-3.5 mm long, the lobes 2-2.5 mm long, ovate lanceolate; corolla tube 11 mm long, the lobes 7-10 mm long, 5 mm wide; 5 stamens attached to the corolla tube just below the throat, and below them sparsely puberulous; filaments 1.5 mm long; anthers 1.5 mm long, 0.8 mm wide, lance-ellipsoid; 2 ovaries 1.2 mm long; styles 4.5 mm long, united in the upper 2/3; stigma



Pl. 3. — *Ochrosia hamakuensis* St. John (from holotype) : a, leaf; b, bud; c, flower; d, flower, cut open; e, calyx; f, stamen; g, pistil; h, i, j, fruit.

1.2 mm long, the lower 2/3 barrel-shaped, the narrower upper 1/3 cylindric; fruit 5.3 cm long, 2.8 cm wide, 1.9 cm thick; lance-ellipsoid; endocarp 4.7 cm long, 1.5 cm wide and thick, lanceoloid; seed 25 mm long, 12 mm wide, 2 mm thick.

EXPANDED DESCRIPTION: Small tree; leaf scars 3-4 mm wide, shield-shaped; blades 2.5-15 cm long, 1.3-6 cm wide; cymes in fruit as much as 16 cm long, and the peduncle up to 6 cm long; fruits 3.8-5.7 cm long, 2.3-2.8 cm wide, 1.4-2.5 cm thick. — Pl. 2.

SPECIMENS EXAMINED: Hawaiian Islands, all from E Maui: *W. Hillebrand & J. M. Lydgate s.n.*, Makawao; *H. Mann & W. T. Brigham 447*, woods above Makawao, 8.1918, BISH, GH, K, NY, US; *J. F. Rock 8615, ibid.*, 2500-3500 ft, 10.10.1910, BISH, GH, NY; *Rock 8682, ibid.*, 11.1910, GH; *Rock s.n., ibid.*, NY; *Forbes 2521.M.*, Papa'āea, 14.6.1920; *R. & S. F. Melville s.n.*, 22.11.1971, 71/1132, 71/1135, W slope, Haleakala, K; *Forbes 1970.M.*, 15.3.1920, 2117.M., 27.3.1920, Auahi, BISH, BM; *Fosberg 41510a, ibid.*, 1200 m, 14.3.1961, US; *G. C. Munro s.n., ibid.*, 12.2.1919, BISH, BM, K, NY, US; 155, 384, *ibid.*, BISH; *Rock 8682, ibid.*, BISH, GH; *Rock 8615*, Makawao, 11.1910, GH; *Hillebrand 318*, Maui, 7.1858, K; *s.n.*, BM.

Planted on Hawaii: *Lamoureux 2607*, Kipuka Pu'au'u, central part, 4000 ft, stake n° 27, 26.11.1963, HAW.

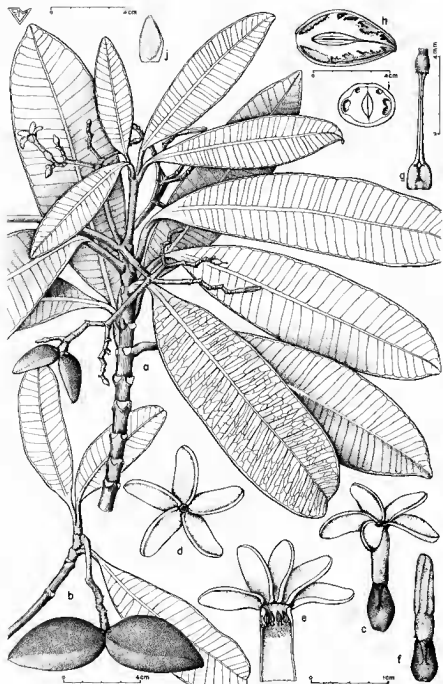
The new epithet is formed from the name of the type locality, Haleakala, the great volcano in east Maui.

4. *Ochrosia hamakuaensis* St. John, *sp. nov.*

Folia 4-verticillata, lamina obtusa; calycis lobi 3 mm longis; corollae lobi 11 mm longi.

TYPE: *Quentin Tomich 966*, Hawaiian Islands, Hawaii Island, Hamakua Dist., Kalopa Gulch, 2300 ft, only one tree, 23.11.1975 (holo-, BISH).

DIAGNOSIS OF HOLOTYPE: Tree 8.3 m tall, 13 cm in diameter, glabrous; sap milky; branchlets 6-8 mm in diameter; bark dark brown, shining, smooth, but wrinkled when dried; internodes 13-35 mm long; nodes slightly enlarged; leaf scars 4-5 mm high, brown, shield-shaped; bundle scar single, U-shaped, large, central; stipules 2 mm long, hemispheric, brown; leaves 4-verticillate; petioles 2.3-2.5 cm long, dull magenta, terete; blades 16-19 cm long, 4.8-5.6 cm wide, coriaceous, above green, shining, below pale green, narrowly oblanceolate, entire, the apex obtuse, the base cuneate, the midrib elevated below, dark towards the base, the numerous secondary nerves nearly parallel from midrib to marginal vein, slightly ascending; cyme apical, 8 cm long; peduncle 4.5 cm long, bracts 0.5-0.7 mm long, hemispheric; calyx 4 mm long, the lobes 3 mm long, ovate, acute, imbricate; flowers off white, fragrant; corolla tube 10-11 mm long, pilosulous within below the anthers, 5 lobes 11 mm long, 3.5-4 mm wide, elliptic; 5 anthers adnate to the corolla tube just below the throat; filaments 0.9 mm long; anthers 1.7 mm long, 0.5 mm wide, narrowly lance-ellipsoid; 2 ovaries 1 mm long,



Pl. 4. — *Ochrosia hiei* St. John (from holotype) : a, habit; b, habit with fruit; c, d, flower; e, flower, cut open; f, bud; g, pistil; h, i, j, fruit.

ellipsoid; 2 styles 5.2 mm long, separate only for the lower 1/9; stigma 1 mm long, urn-shaped; (fruit unknown). — Pl. 3.

SUPPLEMENTARY DESCRIPTION: Fruit 5.8-6 cm long, 3.5-3.6 cm wide, 2.8 cm thick, ovoid, acute, compressed, brown; mesocarp 3-8 mm thick, pink; endocarp 5.6 cm long, 2.7 cm wide, 2.1 cm thick, stramineous; seed 4 cm long, 1.4 cm wide, 0.9 cm thick, lanceoloid.

DISCUSSION: The flowers are fragrant, and open at night. The new epithet is formed from the name of the type locality, Hamakua.

SPECIMEN EXAMINED: *Tomich* 988, Hawaiian Islands, Hawaii Island, later collection of fruit, from the same holotypic tree, 1.5.1977, BISH.

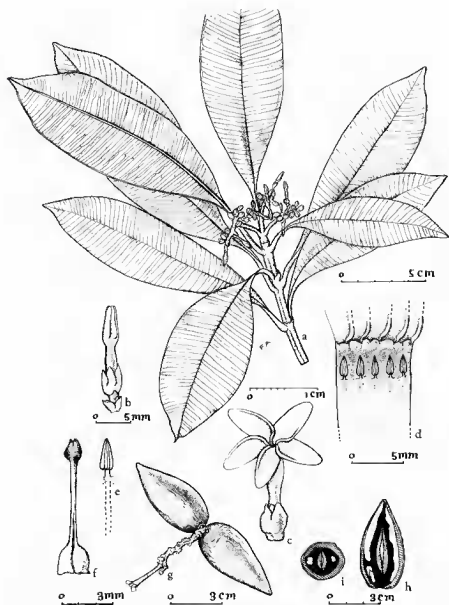
5. *Ochrosia holei* St. John, *sp. nov.*

- *O. sandwicensis* auct. non A. DC.: GRAY, MANN, WAWRA, HILLEBRAND, K. SCHUMANN, and ROCK; *O. sandwicensis* A. DC., Prodr. 8: 357 (1844) is a synonym of *Rauvolfia sandwicensis* A. DC. (1844).
- *Bleekeria compta* auct. non (K. SCHUM.) WILBUR: WILBUR, Pacif. Sci. 20: 260-261 (1966) in large part, non *O. compta* K. SCHUM.
- *O. tuberculata* auct. non (VAHL) PICHON: PICHON, as to Hawaiian plants, not the South American *Macaglia tuberculata* VAHL (1810).

Folia 3-4-verticillata, lamina acuta; calycis lobi 2,5-3 mm longi, corollae lobi 7-8,5 mm longi; drupae 5,2 cm longae.

TYPE: *St. John, R. S. Cowan, G. L. Webster & R. L. Wilbur* 23232, Hawaiian Islands, Oahu Island, Pupukea-Kahuku Trail, Paumalu-Waimea, moist lower forest in head of side gulch, 1100 ft, 25.1.1948 (holo-, BISH).

DIAGNOSIS OF HOLOTYPE: Glabrous tree 7 m tall; trunk 8 cm in diameter; sap milky; internodes 0.4-12 cm long; leafy branchlets 3-6 mm in diameter and with the reddish bark smooth, shining, wrinkled on drying; leaf scars 3-4 mm wide, rounded shield-shaped, pale, slightly elevated; bundle scar single, central; leaf buds glutinous; leaves 3-4-verticillate; petioles 12-27 mm long; blades 6-20 cm long, 1.8-5.4 cm wide, elliptic suboblanceolate, the apex acute, the base cuneate, shiny, above dark green, below green, and with evident parallel secondary veins; cymes 3-11 cm long in flower, loose, many flowered, but only a single terminal flower setting fruit; calyx 4-5 mm long, the lobes 2.5-3 mm long, ovate, imbricate; flower white, turning yellowish, fragrant; corolla tube 10-12 mm long, subcylindric, glabrous without, within puberulous just below the stamens; corolla lobes 7-8.5 mm long, elliptic, asymmetric, circinnate; filaments 0.5 mm long, attached to the corolla tube 1/4 way from the throat; 5 anthers 1.5 mm long, lanceoloid; ovary 2 mm long, deeply bipartite; style 12 mm long; stigma 3.2 mm long, barrel-shaped below the narrower neck; fruit 5.2 cm long, 2.8 cm wide, 2.3 cm thick, narrowly ovoid, obtuse, asymmetric, green, but yellow when ripe; endocarp 5.2 cm long, 2.7 cm wide, 1.9 cm thick, the lateral



Pl. 5. — *Ochrosia kauaiensis* St. John (from holotype) : a, habit; b, bud; c, flower; d, middle of flower, cut open; e, stamen; f, pistil; g, h, i, fruit.

walls 6-8 mm thick; seed 22 mm long, 12 mm wide, 3 mm thick, lanceoloid.

EXPANDED DESCRIPTION: Tree 4-10 m tall; trunk 8-30 cm in diameter; blades 1.8-5.6 cm wide, elliptic suboblanceolate (or elliptic); corolla lobes 7-9 mm long; fruit 3.6-5.8 cm long, 1.9-2.8 cm wide, 1.5-2.3 cm thick, narrowly ovoid to lanceoloid, obtuse or acute, asymmetric, yellow; endocarp lateral walls 3.5-8 mm thick. — Pl. 4.

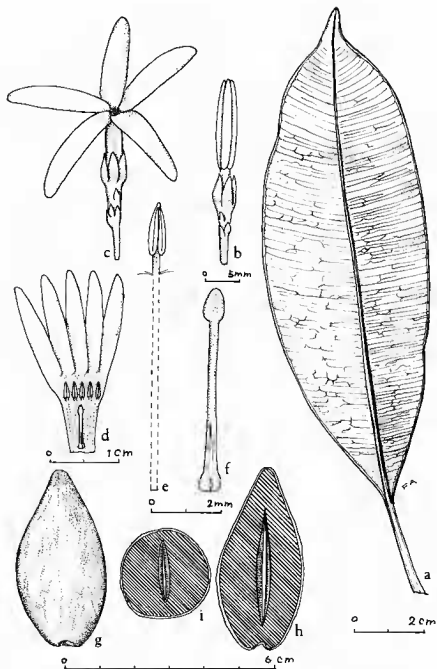
VERN. NAME: *holei* (Hawaiian lang.).

SPECIMENS EXAMINED: HAWAIIAN ISLANDS, Oahu Island, Koolau Range: *R. J. Baker s.n.*, Pupukea-Kahuku Trail, Paumalu-Waimea, rain forest, 1300 ft, 19.2.1933; *R. S. Cowan 512*, Paumalu-Waimea, wooded slope, 1000 ft, 9.2.1947, NY; *M. R. Crosby & W. R. Andersen 1553*, Pupukea Trail, shaded gulch, 1400 ft, 26.6.1964, A; *Degener 4147*, Paumalu Ridge, dry open forest, GH, US; *Degener 9816*, Pupukea-Kahuku Trail, Pupukea, 30.4.1933, NY; *Degener 9820*, Paumalu, forest, 18.10.1931, NY, US; *Degener & K. K. Park 9822*, Pupukea, 19.7.1931, NY, US; *Degener 17593*, Oio, Paumalu Trail, lower forest, 16.6.1940, A, NY; *O. & I. Degener 30090*, Pupukea, partly sunny slope, 1000 ft, 29.7.1965, GH; *Fosberg 9135*, *ibid.*, 19.2.1933; *Fosberg 12239*, *ibid.*, 20.7.1935; *E. G. Holt s.n.*, Laie Trail, 1200-1500 ft, 18.12.1960; *Kawahara s.n.*, Pupukea-Kahuku Trail, Paumalu-Waimea, deep dry gulch, 990 ft, 6.4.1941, A; *A. Meebold s.n.*, *ibid.*, 5.1932; *C. Pemberton s.n.*, Laie, mauka, 4.6.1939; *D. P. Rogers s.n.*, Pupukea Trail, Paumalu-Waimea divide, 9.2.1947; *St. John 11583*, Pupukea-Kahuku Trail, 1200 ft, 6.3.1932; *St. John 12941* *ibid.*, 1100 ft, 19.2.1933; *St. John 21583*, Kaunala-Pahipahilua Ridge, *Metrosideros* forest, 800 ft, 12.5.1946; *St. John 25305*, Pupukea-Kahuku Road, 1000 ft, 7.11.1954; *St. John 25306*, *ibid.*, 7.11.1954; *Spense 3*, *ibid.*, 31.10.1971; *Spense 217*, *ibid.*, 20.9.1973; *G. W. Russ s.n.*, *ibid.*, 7.1930; *O. H. Swezey s.n.*, *ibid.*, 19.5.1935; *R. L. Wilbur 434*, *ibid.*, US. — WAIANAE MTS: *Degener & Judd 9817*, Makua, 27.9.1932, NY, US; *Degener 9819*, Kawaihapai, 27.1.1929, US; *Degener & Dowson 12932*, Kapuhi, Kawaihapai, forest, 1.9.1940, A, NY, US; *Degener, Hatheway & Greenwell 20833*, E side of E Branch, Makaleha Valley, forest, 1600 ft, 2.7.1950, A, BM, G, NY; *Egler & Fosberg 113*, Haili Gulch, dry forest, 17.7.1939, A; *Hatheway 172*, Kukulula, Mokuleia, Trail 20 a, 1200 ft, BM; *Hatheway 181*, Mokuleia, 8.12.1950, BM, G, US; *Hatheway, Degener & Silva 367*, head of SE part, Makua, 1800 ft, 17.9.1950, A, BM, NY; *Hosaka 1330*, Haili Gulch, 1400 ft, 2.2.1936, NY, US; *Rock 25522*, Puu Pane Trail, M1 Kaala, 9.2.1956, BM; *St. John 25575*, Kamokuiki Gulch, Kamananui, edge of low woods, 1000 ft, 17.7.1955.

J. Rémy 366, 367, Hawaii, 1851-55, GH, are definitely of this Oahu species.

DISCUSSION: W. HILLEBRAND (Fl. Haw. Is.: 295-296, 1888), J. F. ROCK (Ind. Trees Haw. Is.: 413, 1913), and K. SCHUMANN (Nat. Pflanzenfam. IV, 4(2): 156, 1897) accepted this tree as the species *O. sandwicensis* Gray, not of A. DC. To be sure, *O. sandwicensis* A. DC. is a synonym of *Rauvolfia sandwicensis* A. DC., both published in the same book in 1844. The various authors who accept the name *O. sandwicensis* Gray, base it upon his article on the Wilkes Expedition plants (Am. Acad. Arts Sci., Proc. 5: 333, 1862). At this place GRAY included in his list of *Apocynaceae*, *Ochrosia sandwicensis* A. DC. It was a listing and accepting of a previously published binomial, and in no sense was either a later homonym or a publication of a new species by GRAY. He gave a brief description of a collection by REMY, but did not describe it as new.

Various later writers have used the name *Ochrosia sandwicensis* for



Pl. 6. — *Ochrosia kitaueaensis* St. John (from holotype) : a, leaf; b, bud; c, flower; d, flower, cut open; e, stamen; f, pistil; g, h, i, fruit.

the common Hawaiian species, crediting it either to A. DE CANDOLLE, or to GRAY. As indicated, the first name was erroneous and has been reduced to the synonymy in *Rauvolfia*, and the second name is non-existent. If anyone should ever effectively publish an *O. sandwicensis*, it would be a later homonym, and hence be invalid.

Most previous authors blend the *Ochrosia* plants from all the Hawaiian Islands into one species, but the writer here presents a different classification.

For the joint concept there is also the name *Bleekeria compta* (K. Schum.) Wilbur, but FOSBERG has demonstrated that these species all belong in *Ochrosia*.

The new epithet, *holei*, is the Hawaiian vernacular name of the species.

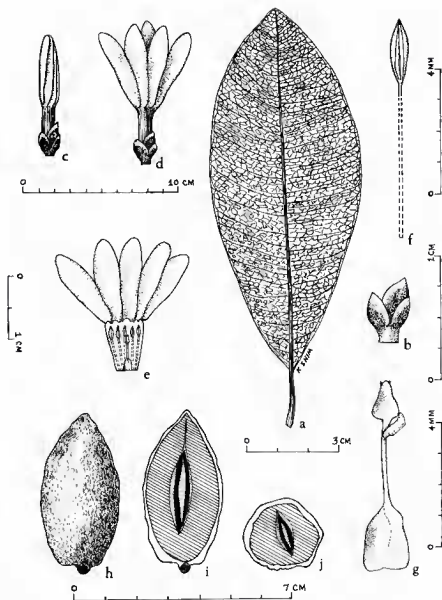
6. *Ochrosia kauaiensis* St. John, *sp. nov.*

Folia 3-4-verticillata, lamina cum apice umbonato; calycis lobi 2.5-3 mm longi, corollae lobi 7-8 mm longi; drupae 5-5.7 cm longae.

TYPE: Charles Christensen 54, Hawaiian Islands, Kauai Island, Napali Coast, Hanakapiai, on a ridge E of the stream, 1000 ft, dryland forest of *Diospyros ferrea*, 8.8.1976 (holo-, BISH).

DIAGNOSIS OF HOLOTYPE: Tree, glabrous; sap milky; internodes 4-35 mm long; nodes slightly enlarged; leaf scars 3-4 mm high, shield-shaped, pale brown, flush; bundle scar single, large, central; leaves 3-4-verticillate on main and most stems (opposite on weak lateral branchlets); stipules 2-3 mm long, hemispheric, membranous, brown; petioles 1.2-3 cm long, channeled above; blades 8.5-15 cm long, 2.5-6.1 cm wide, coriaceous, shiny, above dark green, below green, elliptic oblanceolate, entire, the apex umbonate, the base cuneate and shortly decurrent, the numerous secondary veins parallel and almost at right angles to the midrib which is elevated below; flowering cymes 2.5-4 cm long, from the upper axils, many flowered, but usually only one flower in anthesis per day; peduncle 2-10 mm long; bracts 0.7-1.5 mm long, suborbicular, acute; flowers subsessile; calyx 4 mm long, the lobes 2.5-3 mm long, lance ovate, imbricate; corolla white, with a pale cream-colored eye, the tube 11 mm long, the 5 lobes 7-8 mm long, asymmetric elliptic, white, circinnate; filaments adnate to the corolla tube for 7 mm, the free tips 0.8 mm long; anthers 1.8-2 mm long, 0.8-1 mm wide, lanceoloid, obtuse, shortly bilobed at base; 2 ovaries 1.5 mm long, separate, ellipsoid; 2 styles 5 mm long, connate in the upper 2/3; stigma 1.2 mm long, ovoid, bilobed at tip; fruit twinned, 5-5.7 cm long, 2.6 cm wide, 2.3 cm thick, lanceoloid, slightly asymmetric, subacute, green to brown; exocarp 1-3 mm thick, dry fleshy; endocarp 5.3 cm long, 2.6 cm wide, 2.1 cm thick, lanceoloid, the lateral walls 10-11 mm thick; seed 2.7 cm long, 1.4 cm wide, 5-6 mm thick, lanceoloid, compressed.

EXPANDED DESCRIPTION: Tree 6.6-8 m tall, 1.5-2 dm in diameter; petioles 0.4-3 cm long; blades 7-18 cm long, 2-7.1 cm wide; corolla tube



Pl. 7. — *Ochrosia konaensis* St. John (from holotype) : a, leaf; b, calyx; c, bud; d, flower; e, flower, cut open; f, stamen; g, pistil; h, i, j, fruit.

11-12 mm long; fruit 3.6-5.7 cm long, 1.5-2.6 cm wide, 1.4-2.1 cm thick; seed 2.3-2.7 cm long, 1-1.4 cm wide, 3.6 mm thick. — Pl. 5.

SPECIMENS EXAMINED (all BISH): *Christensen 42*, Hawaiian Islands, Kauai Island, Napali Coast, above Ke'e to Kalalau Trail, not far from where trail enters Hoolulu Valley, 820 ft, very common, dryland forest with *Psychotria*, *Diospyros*, *Osmanthus*, *Cyanea*, *Planchonella*, *Alyxia*, *Pisonia*, *Charpentiera*, *Aleurites*, *Pleomele*, 1.8.1976; *Christensen 48*, *ibid.*, 23.8.1976; *Faurie 433*, Kilauea, 600 m, 1.1910, GH; *Forbes & Dole 75.K.*, Kalalau Trail, 19.7.1909; *Forbes 700.K.*, Hii Mts, 22.10.1916; *Rock 1733*, Kahoaluanu, 3-10.3.1909, K, NY; *St. John, Hosaka & al. 10994*, Hanakapiai, woods, 600 ft, 2.1.1931; *St. John, Britten & Frederick 23167*, Hoalulu Valley, Hanakapiai, Napali Coast, mostly lower woods, 600 ft, 1.1.1948; *St. John, Britten & Frederick 23188*, Hanakoa Valley, moist lower forest, 900 ft, 1.1.1948.

The new epithet is formed from the name of the type locality, Kauai, and *-ensis*, the Latin adjectival geographic suffix.

7. *Ochrosia kilaueaensis* St. John, *sp. nov.*

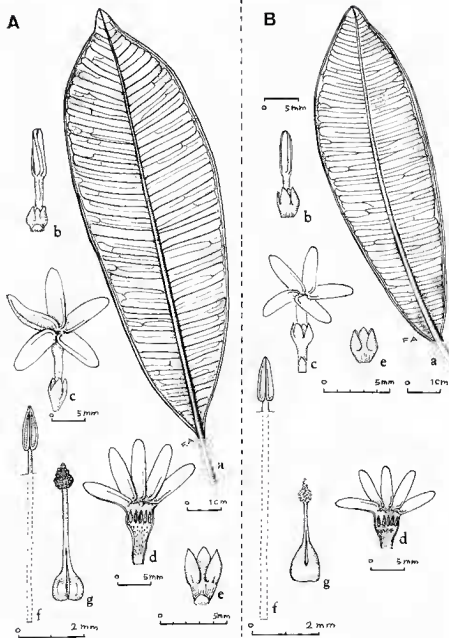
Folia 3-verticillata, lamina subacuminata; calycis lobī 5-6 mm longi, corollae lobī 12-15 mm longi; drupæ 4,5-4,9 cm longæ.

TYPE: *C. Skottsberg 533*, Hawaiian Islands, Hawaii Island, Kilauea, Kipuka, Puau, 1200 m, 16.9.1922 (holo-, BISH).

DIAGNOSIS OF HOLOTYPE: Glabrous tree; internodes 0.7-4.5 cm long; leaf scars 3-3.5 mm wide, almost semi-orbicular, pale; bundle scar single, central; leaves 3-verticillate; petioles 15-20 mm long; blades 7-14 cm long, 2.2-4.6 cm wide, oblanceolate, the apex subacuminate but obtuse, the base slenderly cuneate, above dark shiny green, below pale green and with prominent reticulate venation, subcoriaceous; cymes in flower 7.5-11 cm long, loose, 6-flowered; peduncle 3.3-4.5 cm long; calyx 10-11 mm long, the lobes 5-6 mm long, lanceolate, acute; corolla tube 7-11 mm long, the lobes 12-15 mm long, 4 mm wide, narrowly elliptic; 5 stamens enclosed in the throat, the filaments 0.5 mm long, lanceolate, and the corolla tube below them glabrous; the anthers 1.4 mm long, narrowly lanceoid; 2 ovaries 0.5 mm long, ellipsoid; styles 4.2 mm long, united except at base; stigma 0.8 mm long, ovoid. — Pl. 6.

EXPANDED DESCRIPTION: Tree 18 m tall, with milky sap; petioles 15-26 mm long; blades 6-19 cm long, 2.2-6.5 cm wide, oblanceolate (or elliptic); cymes 7.5-12.5 cm long, 6-12-flowered; peduncle 2-5.3 cm long; fruits 4.5-4.9 cm long, 2.4-2.9 cm wide, 2-2.2 cm thick, ellipsoid or lanceoid, obtuse, slightly asymmetric; endocarp 43 mm long, 17 mm wide and thick, the lateral walls 5-6 mm thick; seed 22 mm long, 9 mm wide, 2-2.5 mm thick. — Pl. 6 and (as *O. sandwicensis*), *Rock, Indig. Trees Haw. Is., tab. 167-169, 1913*).

SPECIMENS EXAMINED: *Forbes 1022.H.*, Hawaii Island, Kipuka Puau, 1.7.1915, BISH, K, NY; *W. W. Giffard s.n., ibid.*, (as Bird Park), 9.8.1927; *Mac Daniels 211*,



Pl. 8. — A, *Ochrosia kondoi* St. John (from holotype) : a, leaf; b, bud; c, flower; d, flower, cut open; e, calyx; f, stamen; g, pistil. — B, *O. microcalyx* St. John (from holotype) : a, leaf; b, bud; c, flower; d, flower, cut open; e, calyx; f, stamen; g, pistil.

ibid., 1300 m, 10.11.1926; *Rock 12995, ibid.*, 8.1917; *Rock s.n., ibid.*, Mauna Loa, 7-8.1911, BISH, GH.

The new epithet is formed from the name of the type locality, Kilauea, and *-ensis*, the Latin adjectival place suffix.

8. *Ochrosia konaensis* St. John, *sp. nov.*

Folia 4-verticillata, lamina obtusa, calycis lobi 4,5-5 mm longi, corollæ lobi 12 mm longi; drupæ 4,8 cm longæ.

TYPE: *J. F. Rock 3928*, Hawaiian Islands, Hawaii Island, woods back of Puuwaawaa, on ancient lava flow, rare, with *Myrsine*, *Straussia*, *Nothocestrum*, 3000 ft, 14.6.1909 (holo-, BISH); *Rock's numbers 3918* (NY, US), *3920* (NY, US, GH) are doubtless duplicates and isotypes, owing to *Rock's* habit of giving every duplicate sheet a different number.

DIAGNOSIS OF HOLOTYPE: Glabrous tree; internodes 6-42 mm long; leaf scars 3-4.5 mm wide, shield-shaped, pale; bundle scar single, central; leaves 4-verticillate on main branches, 3-verticillate on slender lateral branchlets; petioles 15-22 mm long; blades 7-16.7 cm long, 2.2-4.9 cm wide, oblance-elliptic, obtuse, the base cuneate, above shiny dark green, below pale green and with prominent reticulate venation, subcoriaceous; cymes in flower 4-6 cm long, loose; peduncle 12-26 mm long; calyx 6-8 mm long, the lobes 4.5-5 mm long, broadly ovate, apiculate; corolla tube 8 mm long, the 5 lobes 12 mm long, 3 mm wide, narrowly elliptic; 5 anthers adnate to the corolla tube just below the throat; filaments 0.3 mm long; anthers 3 mm long, 0.5 mm wide, oblong ellipsoid; 2 ovaries 2 mm long, ellipsoid; style 2.5 mm long, connate; stigma 0.7 mm long, lanceoloid; drupes twinned, 48 mm long, 24 mm wide, 23 mm thick, elliptic lanceoloid, the lateral walls 9-10 mm thick; seed 23 mm long, 12 mm wide, 5 mm thick. — Pl. 7.

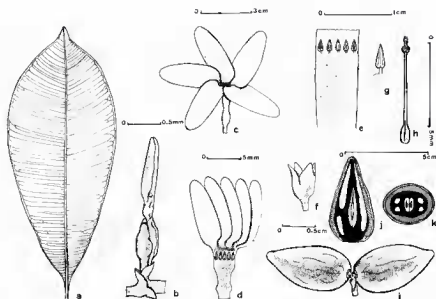
The new epithet is formed from the name of the type locality, Kona, and *-ensis*, the Latin adjectival place ending.

9. *Ochrosia kondoi* St. John, *sp. nov.*

Folia 3-verticillata, lamina subacuta; calycis lobi 3 mm longi, corollæ lobi 8-9 mm longi; drupæ immature 2,7-2,8 cm longæ.

TYPE: *Yoshio Kondo s.n.*, Hawaiian Islands, Oahu Island, Koolau Range, ridge to Puu Kau, 1250 ft, 25.11.1951 (holo-, BISH).

DIAGNOSIS OF HOLOTYPE: Evidently a tree, glabrous; internodes 5-50 mm long, somewhat fleshy, shrinking when dried to form ridges, brown, smooth; nodes enlarged; leaves 3 at a node, or on some weak lateral branchlets 2 or 3 at a node; leaf scars 3-4 mm wide, pale, elevated, hemispheric, the upper edge with a V-shaped notch; bundle scar single, central, U-shaped; stipules 2-2.5 mm long hemispheric, more or less buried in resin; petioles



Pl. 9. — *Ochrosia lamoureuxii* St. John (from holotype) : a, leaf; b, bud; c, flower; d, flower, cut open; e, corolla tube; f, bud; g, stamen; h, pistil; i, j, k, fruit.

8-18 mm long, channeled above; blades 8-13 cm long, 2.7-4.6 cm wide, coriaceous, symmetrical and narrowly elliptic (or slightly narrowed below the middle), entire, above green and shiny, below paler yellowish green, the apex abruptly subacute, the base cuneate, the numerous secondary veins parallel, slightly ascending; flowering cymes 4-5 cm long, several flowered; peduncle 2-4 cm long; bracts 1 mm long, hemispheric, acute; pedicels 2 mm long; calyx 4.2 mm long, with lobes 3 mm long; corolla with the tube 10 mm long, puberulous within, the 5 lobes 8-9 mm long, narrowly elliptic, circinnate; filaments adnate to the corolla tube for 6.5 mm, the free tips 0.3 mm long; anthers 1.3 mm long, 0.4 mm wide, narrowly lanceoloid; ovary 0.7 mm long, of 2 ellipsoid carpels; style 2.5 mm long, filiform glabrous, connate in the upper 3/4; stigma 0.8 mm long, the lower half cup-shaped, the upper half ovoid, both covered with rounded projecting glands; fruiting cymes 10-12 cm long, about 30-flowered, but only one flower setting fruit; immature drupes 27-28 mm long, 9-10 mm wide, lanceoloid. — Pl. 8 A.

The new epithet is selected to honor the collector, Dr. Yoshio KONDO, malacologist of the Bishop Museum, Honolulu.

10. *Ochrosia lamoureuxii* St. John, *sp. nov.*

Folia 3-verticillata, lamina subacuminata; calycis lobi 4,5 mm longi; corollae lobi 10-11 mm longi; drupæ 4,7-5,5 cm longæ purpureo-nigræ.

TYPE: *Charles H. Lamoureux 1429*, Hawaiian Islands, Oahu Island, upper Punaluu Valley, Koolau Mts, 700-1000 ft., 30.12.1959 (holo-, BISH; iso-, HAW).

DIAGNOSIS OF HOLOTYPE: Tree 10 m tall, glabrous; branchlets 4-7 mm in diameter, brown, shining, smooth, but wrinkled when dried; internodes 4-4.5 mm long; nodes enlarged; leaf scars 4 mm tall, shield-shaped, the top widely concave, brown, elevated; bundle scar single, large, elliptic, central; stipules 2 mm long, hemispheric, membranous; leaves 3-verticillate; petioles 12-20 mm long, channeled above; blades 8.5-15 cm long, 3.6-6.5 cm wide, coriaceous, above dark green, below yellowish green, broadly oblanceolate, entire, subacuminate but obtuse, the base shortly cuneate, the midrib elevated below, the numerous secondary veins nearly parallel, from midrib to marginal vein, slightly ascending; inflorescence in flower 4-8 cm long and wide, cymose, 15-many-flowered; peduncle 3 cm long; bracts 1.5-2 mm long, broadly ovate; pedicels 2-3 mm long; calyx when fresh 7 mm long, with lobes 4.5 mm long, but when dried 5 mm long, with lobes 4 mm long; corolla creamy white; the tube 8 mm long, puberulous within, the 5 lobes 10-11 mm long, oblong elliptic, asymmetric, circinnate; filaments adnate to the corolla tube for 6 mm, the free tips 0.4 mm long; anthers 1.4 mm long, 0.6 mm wide, narrowly oblanceoloid; ovary 1.1 mm long, ellipsoid; style 4.2 mm long, filamentous; stigma 1 mm long, vase-shaped; infructescence 15 cm long, borne from an axil just below the leaves; peduncle 4.5 cm long, the branch bearing the only pair of fruits thickened; drupes dark purplish black, 47-55 mm long, 25-27 mm wide, 20-22 mm thick, asymmetric ellipsoid, obtuse; exocarp 4-5 mm thick, fleshy and fibrous; endocarp 45 mm long, 22 mm wide, 13 mm thick, the lateral walls 3-4 mm thick, bony, brown; seed 30 mm long, 9 mm wide, 2 mm thick, lanceoloid, compressed. — Pl. 9.

The new epithet is chosen to honor the collector, Dr. Charles Harrington LAMOUREUX, professor of botany, University of Hawaii.

11. *Ochrosia microcalyx* St. John, *sp. nov.*

Folia 3-4-verticillata, lamina obtusa; calycis lobi 2 mm longi, corollae lobi 7 mm longi.

TYPE: *W. H. Hatheway & O. Degener 500*, Hawaiian Islands, Oahu Island, Wailupe Valley, E side of central ridge, lower forest, rich dry forest with *Sideroxylon*, *Neraudia*, *Eugenia rariflora*, *Dracyna aurea*, etc., 1500 ft., 19.12.1950 (holo-, BISH).

DIAGNOSIS OF HOLOTYPE: Tree 3.3 m tall, glabrous; internodes 1-7.5 cm long, dull reddish to purplish, smooth, shiny, but on drying with longitudinal ridges; nodes slightly enlarged; leaf scars 4 mm wide, broadly lunate, pale brown, elevated; bundle scar single, central, semiorbicular; leaves 3-4-verticillate; stipules 3 mm long, semiorbicular, brown; petioles 10-23 mm long, channeled above; blades 9-11 cm long, 1.8-3.9 cm wide, coriaceous, above shiny dark green, below yellowish green, oblanceolate, entire, the

HAWAIIAN ISLANDS ASSEMBLED

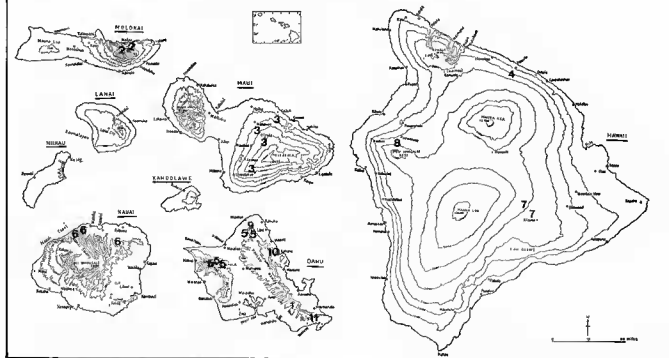


Fig. 10. — Distribution of *Ochrosia* species in the Hawaiian Islands; the numbers of the map are identical with the text numbers of the various species, and also those in the key, as follows: 1, *O. campta* K. Schum.; 2, *O. forbesii* St. John; 3, *O. halcakale* St. John; 4, *O. hamakuaensis* St. John; 5, *O. holei* St. John; 6, *O. kauaiensis* St. John; 7, *O. kilaueensis* St. John; 8, *O. konaensis* St. John; 9, *O. kondoi* St. John; 10, *O. lamoureuxii* St. John; 11, *O. microcalyx* St. John.

apex obtuse, the base shortly cuneate and decurrent, the numerous secondary veins slightly ascending, running towards the margin, and near there forming a strong sinuous marginal vein; flowering cymes 4-9 cm long, many flowered; peduncle 10-17 mm long; bracts 1.3 mm long, semiorbicular; flowers subsessile; calyx 4 mm long, the lobes 2 mm long, ovate, imbricate; flowers not fragrant; corolla pure white; the tube 4 mm long, the 5 lobes 7 mm long, asymmetric elliptic oblong, circinnate; filaments adnate to the corolla tube for 2 mm; free filament tips 0.4 mm long; and below them the corolla tube puberulent; anthers 1.3 mm long, 0.5 mm wide, oblong lanceolate, retuse at base; 2 ovaries 1.1 mm long, lanceoloid; 2 styles 1.3 mm long, connate in the upper half; stigma 0.6 mm long, the lower half globose, the upper half narrowly conic; (fruit unknown). — Pl. 8 B.

SPECIMENS EXAMINED: *F. E. Egler* 37-227, Hawaiian Islands, Oahu Island, Koolau Range, Kapakahi, on W side of gulch, in native forest, koa zone, 22.7.1937 (holo-, BISH).

The new epithet is formed from the Greek words *mikros*, small, and *kalux*, cup or calyx, and it refers to the size of the calyx.

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